



## IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the

Application of: ROBERT A. HORTON ET AL.

Application No.: 10/675,292

Art Unit: 1713

Examiner: JUDY M.  
REDDICK

Filing Date: SEPTEMBER 30, 2003

Title: PATTERN MATERIAL

### DECLARATION OF ROBERT A. HORTON

Commissioner for Patents

**Mail Stop Amendment**

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I, Robert A. Horton, declare as follows:

1. I am the co-inventor of the above-identified patent application.
2. I am Vice President of Precision Metalsmiths, Inc., assignee of the above-identified application.
3. I have been employed by Precision Metalsmiths, Inc. for approximately thirty-two (32) years. Prior to my current position, I was pilot Plant Manager, Director of Research, and Vice President of Research and Development.
4. I am the inventor named in at least thirty-seven (37) U.S. patents including 3,296,006 and 4,064,083.
5. In the lost pattern process of investment casting, it is often desirable to produce the patterns by machining blocks of pattern material to the desired casting shapes instead of

making the patterns using injection equipment. The current trend toward large patterns require the pattern material to be cast in large blocks for example, blocks that are 6" x 6" x 6" or larger.

6. The '006 patent discloses pattern material made from ethyl cellulose and fatty acid ketone. It has been found difficult, and in many cases impractical, to cast this material in large, machinable blocks without internal shrinkage and excessive cavitation or dishing in the outside walls.

7. The '083 patent is an improvement over the '006 patent and discloses a pattern material made of an ethylene vinyl resin and at least one fatty acid ketone. This material reduces or eliminates mold cracking problems that sometimes occurred when using patterns made from the fatty acid ketone/ethyl cellulose composition, but internal shrinkage and cavitation remained a problem when cast in large blocks of the size indicated above.

8. The invention of the above-identified application is an improvement over both the '006 and '083 patents, and is a pattern material made of an ethylene-vinyl resin, fatty acid ketone and fatty acid. The combination of fatty acid and fatty acid ketone has the completely unexpected and unpredictable result of nullifying the excessive tendency of ketone based compositions towards shrinkage and cavitation.

9. Fatty acids and fatty acid ketones are not equivalent materials. There are great differences in their chemical formulas and molecular weights, with the ketones having a much higher molecular weight than the fatty acids. The properties of waxes (and organic materials in general) depend on their molecular weights, number of carbon atoms and substituent chemical groups. Consequently, ketones and fatty acids cannot be considered equivalent of each other either functionally or chemically.

10. In order to demonstrate the lack of equivalency, the following simple experiment was conducted. Two wax cylinders measuring 2 1/2" in diameter by 3 3/4" in height were made. One cylinder was made from the preferred composition of the '083 patent (ethylene vinyl/ketone). The second cylinder was made of the same ethylene vinyl resin, but having lauric acid substituted for laurone and stearic acid substituted for stearone. The specific compositions were as follows:

Cylinder 1

Ethylene vinyl acetate - 10%  
Laurone - 45%  
Stearone - 45%  
Lauric Acid - 0%  
Stearic Acid - 0%

Cylinder 2

Ethylene vinyl acetate - 10%  
Laurone - 0%  
Stearone - 0%  
Lauric Acid - 45%  
Stearic Acid - 45%

The cylinders were poured at the same time and tested at the same time after solidification for hardness using a Precision Penetrometer. Readings were taken of the depth of penetration (in tenths of a millimeter) of the unit's standard needle across a diameter of each sample. For the ketone containing wax, all of the readings were only 0.6 of a millimeter. For the fatty acid containing wax, the depth of penetration was two and one-half times greater, i.e. 1.5 of a millimeter.

In addition, the following two qualitative observations were made:

- a) The softer acid-containing sample had a pock-mark condition of shallow depressions over its entire vertical surface. The harder ketone containing one had a perfectly smooth surface.
- b) The acid-containing composition produced acrid, irritating fumes which became worse as heating progressed. The ketone containing composition produced only a bland odor with no irritating fumes.

The forgoing test clearly demonstrates the lack of equivalency between fatty acids and fatty acid ketones. Fatty acids result in softer compositions having poor physical characteristics, while the fatty acid ketone composition had good physical characteristics.

When faced with the problem of shrinkage and cavitation of cast material, we discovered the totally unexpected and unobvious synergistic affect of combining a fatty acid with a fatty acid ketone, namely, elimination of shrinkage and cavitation. This effect would not be expected by the foregoing test which would indicate that a fatty acid component is undesirable.

11. I have read and understand U.S. Patent No. 3,811,903 (Daskivich). The patent lists many "waxes" including stearic acid, lauric acid, stearone and laurone, but nowhere in the patent is it suggested that the ketones and fatty acids are equivalent materials which, in fact, they are not. In addition to disclosing ketones and fatty acids, the patent discloses Fisher-Tropes wax, micro-crystalline waxes, paraffin wax, etc. No one knowledgeable in the art would consider these latter waxes to be the equivalent of fatty acid ketones and fatty acids.

12. I have read and understand the claims of the above-identified application, and, based on my experience, education and the many patents that I have obtained, I believe the claims of said application are patentable. I know of no suggestion in the prior art that the addition of a fatty acid to the ethylene vinyl-acid/ketone system of the '083 patent would make it possible to cast large blocks of pattern material without surface cavitation and internal shrinkage.

I declare that all statements made herein of my own knowledge are true and all statements made on information and belief are believed to be true, and further, that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine

or imprisonment, or both, under §1001 of Title 18 of the United States Code and that such willful  
false statements may jeopardize the validity of the application or patent resulting therefrom.

June 21, 2004

Date

Robert A. Horton

Robert A. Horton